

ART. I.—*On the Discovery of Fossil Fish in the Old Red Sandstone Rocks of the Mansfield District.*

With Plates I, II, and III.

By GEORGE SWEET.

[Read April 6, 1889.]

SOME twenty-five years ago, the attention of Mr. Selwyn, then Director of the Geological Survey of Victoria, was directed to some specimens of a purplish red sandstone rock, containing a few fragments of plant remains from the Battery Hill, near Mansfield.\* The fossils were submitted to Professor McCoy, who studied them, and in consequence, recommended Mr. Selwyn to colour the Mansfield area as Old Red Sandstone.

Some twenty years after, Mr. Reginald A. F. Murray, the present Government Geologist, during his geological examination of the district, obtained fossils which had been found by Messrs. Tolmie, sons of the then owner of the Dueran Station.†

These were also examined by Professor McCoy, who has been kind enough to write to me as follows concerning them:—"Mr. Murray brought me some vegetable fragments and the remarkable cephalic shield, to which I have given the name of *Rhytidaspis murrayi*, in his honour, as well as the first example of the large *Ichthyodorulite*, which you have since found in such abundance, so curiously resembling, both in size, shape, and tuberculation, the *Gyracanthus obliquus* (McCoy) from the base of the carboniferous series of the North of England, as to suggest that that genus might not be *Selachian*, but belong to the head and other parts of the body of fish of different affinities.‡" These relics were of too

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\* "Notes on the Physical Geography, Geology, and Mineralogy of Victoria," one of the International Exhibition Essays, 1866, by Mr. A. R. C. Selwyn.

† Memorandum of Mr. R. A. F. Murray, Geological Surveyor of the Department of Mines.

‡ Memorandum of Professor McCoy, C.M.G.

great interest to be forgotten; and, in the beginning of last year, at the instance of Professor McCoy and Mr. Murray, the Secretary for Mines, Mr. C. W. Langtree, provided funds for a further investigation.

The Rev. A. W. Cresswell accordingly visited the district. He spent a day or two or there, and searched along the Broken River, near its junction with the Bridge Creek, and some distance up the latter. He found some interesting fossils himself, and left two men under the supervision of Mr. P. Bromfield, the Shire Secretary, with directions to excavate for more\*, with the result thus summed up by Professor McCoy:—The Rev. A. Cresswell procured some “scales” allied to those of *Glyptolepis* in appearance; and examples of still greater interest of Acanthodian fishes related to known Old Red Sandstones types. He also brought various examples of the *Lepidodendron mansfieldense* (McCoy), of which lithographic figures have been prepared for the Decades of Palæontology of Victoria, with all the details necessary for a satisfactory recognition of the species, which is quite distinct from the *Lepidodendron australe* (McCoy)† of the Avon River, Gippsland. Yet these were, except in the case of the *Lepidodendron* just referred to and an Acanthodian fish and one or two others, so fragmentary that determination was both difficult and hazardous.

Mr. Cresswell was, however, unable to spare time for further work in the field, and Professor McCoy did me the honour to suggest that I should undertake a more thorough examination of the rocks of that locality. The Secretary of the Mining Department, Mr. Langtree, promised to render every assistance, and to supply a limited sum to employ men to quarry. As I feel great interest in the ancient forms of life, and possess a certain amount of ambition to assist in obtaining more complete knowledge of the remains which are at present hidden in the rocks on this side of the globe, I consented to undertake the work. We left Melbourne on the eighteenth of December last, at which date only, the services of Mr. James Tolmie could be secured as guide, and reached Mansfield on the nineteenth.

The first characteristic purplish red sandstone rock makes its appearance on the roadways, having been used for repairing them, shortly after leaving the highly-inclined

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\* Memorandum of Rev. A. W. Cresswell, M.A.

† Memorandum of Professor McCoy, C.M.G.

Upper Silurian strata of Maindample and Doon. Reaching an elevation in the track near the Paps (a considerable hill to our right, terminating in two peaks), other striking features of this district come into view; its beautiful park-like character, well grassed and thinly timbered, with fair sized red gums; while beyond, the distant hills, with their slightly inclined strata and almost horizontal tops, can be plainly seen. Mount Timber Top is seen straight before us some distance away. Slightly to the left, and apparently near by Mansfield, but proving on closer acquaintance to be a mile or two distant from the township, is the conspicuous Battery Hill, called by way of compliment Mount Battery; while farther back, and more to the left and north, range in apparently close proximity the Wombat, Table Top, and Hat Hill, all more or less conspicuous from their almost horizontal tops, and occasional long lines of shelf-like projecting rocks. These attract more and more attention till we reach Mansfield. From the township, a walk of a few minutes only brings us to Ford's Creek, on the Benalla Road, where we are face to face with broad surfaces of flat sandstone rock, many yards in width, visible for a considerable distance in its bed. To the north-east, at a short distance, is the Mount Battery, whence the fossil plants came which attracted the attention of Mr. Selwyn. In a northerly direction, to the summit of the Wombat, Timber Top, and Hat Hill, attaining an altitude of from 2000 to 3000 feet, every creek, cutting, or protruding rock exhibits hard gritty flagstones of reddish brown to purplish red, with chocolate and claret coloured fine grained sandstones (some having a micaceous character), interstratified with very thick beds of rubbly shale and mudstone, resembling rocks I have seen at the Iguana Creek, and the Avon River in Gippsland.

Examining the formation along the Broken River, from the old bridge at Dueran to the spot searched by Mr. Cresswell, and on to Mr. P. O'Halloran's selection, and into the enclosure known as the Tannery Paddock, being part of what is now Mr. Mitchell's Dueran Estate, I found them composed of chocolate coloured rubbly shales changing to a purplish tint, interstratified with beds of much harder material, showing in places ripple and other markings. Having reached the spot shown to me by Mr. James Tolmie, where he found the fragment of *Ichthyodorulite*, resembling *Gyracanthus*, I ascertained them all to have been found as freestones, and not *in situ*.

The Broken River, for a considerable distance in this neighbourhood, runs approximately from east to west, while the strata dip at an angle of from  $4^{\circ}$  to  $8^{\circ}$  to the south-west, the general inclination of the land surface on the north, as of the strata, from the tops of the Hat Hill, Table Top, &c., six miles distant, except where denuded and scooped out to form the deep valleys which can often be observed, is toward the river.

The western boundary of these rocks, north of the Broken River, is approximately along the line of the Blue Range Creek, where they abut on, and appear to overlap, the granite rocks which culminate in the Blue Ranges.

The strata on the south side of the river continue to dip, wherever seen, in the same direction, and at about the same angle as on the north side. The land surface generally, however, rises slowly from the river for a few miles, till it reaches the watershed of the Delatite River and its tributaries, not, however, without an occasional hill, evidently the remains of an extensive and almost horizontal area, which the denuding agency of the receding waters failed to remove. By far the most conspicuous of such, is the Battery Hill before referred to, and several others on the north of Broken River, including the Hat Hill, Table Top, &c. The small hill, also on the north of the Broken River, and to the west of Bridge Creek, visited by Mr. Cresswell, is one example; and the somewhat larger hill, a mile further east, close to the river, forming a part of Mr. P. O'Halloran's and Mr. Mitchell's properties, and containing an area of about one hundred and twenty acres, is another. It is with these two last-named elevations, and chiefly the latter, that this paper is concerned, as it was this place which appeared to me to present the greatest facilities for ascertaining the succession of the various strata, and obtaining fossils.

Our camp was fixed at 11 (Plate 1) on the south side of the river, so as to be near at hand. The wisdom of this was soon apparent, as we were thus enabled to use all available daylight for our work. For though the employés worked but eight hours per day, my investigations occupied me nearly double that time, daylight being supplemented by the lamp, for some of the work that had to be done.

If we start from the point at which the line Y Y bisects the hill on its western side, the site of No. 1 in sketch, indicating the first excavation, and look south-west, we at once notice a steep embankment, which slopes some thirty

feet down to the river flats below, and forming the upper ledge of this embankment, and immediately below the surface, a band of hard rock four feet in thickness, which has served to protect the underlying beds from denudation, and has thus played an important part in determining the present conformation of the hill. Looking north-east, the hill rises before us in a plane, closely parallel to the plane of stratification of this band. If we now walk along the embankment with the hill on our left, we gradually come down to the level of the river, and obtain evidences of its action. Some of the rocks have been undermined by the flood waters, and stand out in bold projections; others lie with their upper surface exposed in large flags, which occasionally show ripple-markings, and an innumerable number of what seem to be fucoids or the castings of worms. As we come round the hill, and approach the point, No. 9, where the line Z Z<sup>11</sup> crosses the river, the rocks form its bed for a short reach, and pass out of sight on the other side. Beds, superior to any now remaining on this hill, have been revealed by the flood waters on the other side of the river; while a little to the east of this line, clear evidence exists that the river has cut for itself a considerable depth and width through the hard rocks into the softer rubbly shale or mudstone.

The general appearance of the locality favours the view, that at no very distant period of time the flats above this point were occupied by the waters of a lake, extending over the Tannery Paddock and beyond. These flats are in winter almost a swamp, and where it is cut by the river, I found that the alluvial deposits attain a depth of some twenty feet. The erosion of the hard rocks at this lower extremity has, I think, drained the lake.

Continuing on the north side of the river, along the embankment, which now becomes more steep with the projecting rocks shelving out, several lower beds show themselves along the escarpment, marked No. 8. A short distance from here, the embankment ceases to be precipitous, and slopes out a long way to the flats. On reaching the point marked Z<sup>11</sup>, the aneroid indicated one hundred and forty feet above the river. Hence, to the point of commencement, the north sides of this isolated remnant of what was once an extensive plateau, stretch away to the lower land. A survey of the country around, from the highest part of this hill, gives evidence of its former continuity with several other elevations

on the north of the river. The sloping surfaces of the hills are seen to be nearly in one plane, including that visited by Mr. Cresswell, to the west, and the Hat Hill. It reveals also the chief cause of their isolation, which is clearly the extensive denudation which has taken place during the slow elevation of the land through the waters, intensified by more recent causes. The action referred to has removed the rock for a depth of one hundred and thirty feet from the top of this hill (marked Z<sup>11</sup> on sketch) to the flats below, exposing a series of twenty-four beds of varying thickness.

As will be observed from the specimens exhibited, the prevailing rock of the north-east of this declivity of the hill is a rubbly and nodular shale or mudstone, of chocolate, claret, or purplish-red, and in one or two cases of a pale green and greenish-blue colour, so much so, that of the twenty-four beds of rock, thirteen, having an aggregate thickness of one hundred and fifty-two feet, are of this character, interstratified with eleven beds of different rocks.

These eleven contain a thickness of only eight feet six inches, giving a total thickness of beds of all kinds of one hundred and sixty feet, but which, owing to the inclination of the beds, and the five upper beds not being found till the summit of the hill is passed, gives but one hundred and thirty feet as the altitude of the hill above the river flats.

Let me now direct attention to the various strata, their general character, and the fossils found in each, beginning at the lowest stratum observed, at the north-east of the hill indicated by Z<sup>1</sup> on the line Z Z<sup>11</sup> Z<sup>1</sup>.

The lowest member of the series observed (Plate 2, A) was a dull red dense micaceous sandstone. In this, no fossil remains were detected, and the lower limit was not seen, but a few feet being exposed. Resting on this is a bed, thirty feet thick, of the dull purplish, rubbly, nodular, and calcareous shale or mudstone before referred to. Next, we reach six feet (B) of a bluish-green calcareous mudstone shale, slightly micaceous, and retaining the rubbly and nodular character of the thirty feet bed of mudstone rock on which it rests. Then follow fifteen feet (C) of rock similar to A, bearing on it one foot (D) similar to B, and then another fifteen feet (E) similar to A. We now reach a six inch stratum (F) of much harder rock, which has resisted the action of the weather more than any of those named, and projects out in a long yellow line. This, when broken into, displays a bluish-grey arenaceous limestone, slightly micaceous, chang-

ing to light yellowish-brown on exposure and loss of lime. No. 5 excavation was on this bed.\* Then twenty feet of rock (G) similar to A, are met with. We now reach a most interesting bed (H) (excavation No. 4) about nine inches in thickness, of calcareous and micaceous sandstone, of varying colour; the prevailing rock being of a dense, dark, bluish-grey, having lenticular patches, some of a yellowish, and others of a green tint.

Material similar to the lower bed A was then passed through in bed I for twenty feet.

J is a six-inch bed of brecciated fine-grained calcareous sandstone, resisting the action of the weather, and ledging out, having a very mottled appearance.

K is eight feet of similar rock to A.

L is a six-inch mottled bed similar to J.

M has six feet of similar material to A, except that it is lighter, being more of a chocolate colour; and in N for four inches J is repeated. O again repeats M.

P is an eight-inch stratum, similar to J in being mottled, though of a lighter colour, changing to a yellowish-brown on exposure, but having on its under side lenticular masses of siliceous and calcareous breccia of a dark purplish colour, on which No. 6 trench and excavation were made.

Q has four feet more of the chocolate-coloured rubbly shales similar to M; and in R we have the bed in which the greatest amount of excavation was done, as on it were situated Nos. 2, 3, and 7. It is a six-inch, highly-laminated, chocolate-coloured shale, slightly calcareous, scaling off in thin flakes, and containing oval-shaped lenticular masses of dense, dark purplish calcareous sandstone, changing to a lighter colour on exposure.

The S bed immediately above this again resembles M for four feet, and then a nine-inch bed (T) of dense dark stone, changing to light chocolate or claret-coloured ferruginous and micaceous sandstone is seen.

Resting on this is a twelve feet bed (U), similar to M.

V is a two-feet stratum of irregularly-bedded ferruginous sandstone shale.

Above this is another two-feet bed (W), and highest of the series on this side of the river, though occurring only on the

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\* The numbers of the excavations are in the order of their commencement. For facilitating recognition by the workmen, and the correct reference of the fossils to their proper beds, the numbers of the excavations were fixed to each specimen.

lower part of the hill, no great distance above the river, apparently composed of similar material to the last, but more dense and compact; so much so that in quarrying, in one or two cases, blocks were dislodged some tons in weight, and very difficult to break up.

Some idea of the extent of the operations may be gained from the fact that the ten hands engaged, beside searching the surface over a large area, removed, in the five weeks during which the operations were continued, over five hundred tons of earth and rock, much of the latter having to be carefully broken and searched, to obtain the three hundred specimens with which our labour was rewarded.

Having determined these various strata, I now needed to obtain palæontological evidence of their age. There are considerable quantities of freestone on the surface, from which, occasionally, very interesting fossil specimens were, with considerable search, obtained.

On the evening of December 23rd, during a walk among some large heaps of stone collected from a patch of cultivated land below and to the north of "7," I had, looking between the stones as the setting sun cast its light in the interstices, espied distinct fish scale markings on an under stone, and on removing the stones pressing on it, found it to be the cast of a fish differing in appearance from any I had before seen. It was about thirteen inches long and four inches broad, with the scales and scale-markings deeply and plainly pitted in the stone. Neither the head nor tail are perfect, but the anal fin is both large and distinct, and the dorsal fin can also be discerned. This specimen has since been named *Cosmolepides sweeti* (McCoy).

Yet the importance of tracing these remains to their natural bed, and of obtaining them *in situ*, was fully recognised. To effect this, efforts were continued for some days, with the result that one bed (P) was suspected to be the one from which certain remains had come.

On the horizon of K, I had discovered portions of fish with a form of scale much smaller, but in other respects like that I had found on the 23rd, and retaining in this case their bony structure. I had set a man to work to trench up the hill side, hoping to strike the bed from whence they had come. While he was thus engaged on the morning of the 26th of December last, continuing myself the surface search near to him, I opened a stone by splitting it along the bedding plane, and to my delight, a half of one of the



Ganoid fishes, some ten inches long and three inches broad, with its heterocercal tail, and portion of the trunk clearly defined, was exposed, also a portion of the anal fin; and on the stone being fully opened, it displayed in its scale-markings the same rhomboidal character observed in the large fish, with the osseous structure noticed in the smaller one discovered a few days before.

These were as finely sculptured, the form in some being very distinct. The scaly trunk is well shown, some of the scales in counterpart, with most of the head portions of the pectoral, anal, and caudal fins and gill plates. Nothing was observed of the internal skeleton of the trunk, and no traces of ossified ribs were seen. The fins, where not removed, have distinct rays. The specimen is in the hands of Professor McCoy, for complete description, by whom it has been named *Cosmolepides sweeti* (McCoy). The search was continued till the highly-laminated shale (R), with its oval-shaped lenticular masses on the under-side of varying thickness and size, from a few inches to three or four feet were met with. This bed was followed for some distance, when lenticular stones were opened, having the same lithological character as that in which the first whole fish was found, and in such masses we subsequently found most of the fish remains of that bed. When it had been proved that this was the bed from which the lenticular masses containing the fish had come, the discovery of the other fossil-bearing beds soon followed, so that now I am in a position to point out the several beds in which the particular fossils were found.

Several other trenches were opened up in the course of the search, for similar purposes.

We now come to observe the fossils found *in situ* at the various beds.

In the thirteen beds of rubbly shale, with an aggregate thickness of one hundred and fifty-two feet, but few organic remains were seen, except on the line of contact between them and the adjoining beds.

The first bed in ascending order containing many fossils was F. From this bed were obtained several *Ichthyodorulites*, a portion of large *Gyracanthus*-like spine, and a large bone belonging to the head of a *Ganoid* fish, with other large undetermined Ichthyic remains, now in the hands of Professor McCoy. A few scales, some an inch and a half in diameter, allied to *Glyptolepis*, and a tooth, about an inch in length of a conical form, curved and hollow, with a few

more fossils. But, owing to one part of the matrix being very hard, and the other quite soft, great difficulty was experienced, when after long search specimens were obtained, in preventing their destruction in relieving them sufficiently of the matrix to be recognisable.

In H, there are, here and there, patches an inch in thickness of comminuted fish-scales and bones, covered by a yellowish, pale green film; and in this film, as also occasionally in the lower parts of the bed, several fish were found, resembling *Cosmolepides sweeti* (McCoy), similar to that found near to and in No. 2. But though so thin, yet so refractory was this film found to be, that even when the dim outline of a fish could be seen, it was often found impossible to clear the film away and get at the fish without destroying it.

However, by removing a few scores of tons of earth and rock, and after expenditure of much labour, several specimens were secured, containing different parts, and in the aggregate, every part of the fish. It was here that a large heterocercal tail was found, measuring about six inches across, apparently *Cosmolepides sweeti* (McCoy). It was also near this horizon that the first larger fish of the same species was met with on December 23rd.

Large scales were rare in this bed, but one or two conical teeth were found here, and several spines, like those of *Gyracanthus obliquus* (McCoy).

P was found to be important, from its containing isolated patches of fossils of a species of very large fish, with large scales so nearly resembling, in some respects, the rare *Phyllolepis*, as to give one or two geologists an impression in favour of its identity with that little known species, or *Glyptolepis*.

These clusters provided considerable material for investigation, including large bony plates, one, eight inches by four, still retaining much of its original appearance and structure; large opercular plates, one probably the quadrate bone, exhibiting their radiating appearance and slightly corrugated edges; also one very large mass of bones of the skull of an undetermined fish; several detached, curved, and conical teeth about an inch long; large bones of the head of Rhizodont fish, and large portions of another jaw, with the teeth in position, and showing their internal structure. (These are now in Professor McCoy's hands).

Two specimens of jaws have since been found in softer stone, which I have succeeded in relieving from their matrix,

so that the whole of this portion of jaw can be inspected—one, showing twenty teeth of a conical shape, from one-quarter to three-eighths of an inch in height; the other, with a large double-pointed tooth with the apices missing, still about one inch by half an inch thick at the base, and one inch and three-quarters high, having portions of other much smaller teeth adjoining it. Also some constricted bones of various size from one inch to two inches in length—"probably hyoid bones of large fish"—and some long, fine, cylindrical bony spines, like detached branchiostegal rays have been found.

R.—This is the bed before referred to, as being the first in which I found the approximately complete fossil fish, *Cosmolepides sweeti*. From this bed, also, a sufficient number of specimens were obtained, to enable the whole of the parts to be fully made out. Conspicuous in this bed are the bi-lobed pittings everywhere observed, and covering every leaf of shale. It is here, also, that we find the first plant impressions *in situ*, lying in the same plane of bedding as the fish, and one or two specimens exhibiting unmistakable *Lepidodendron* characters. They are, however, of comparatively small size.

This bed has also yielded several specimens of a pitted structure like *Bothriolepis*, but in reality *Bothriobolus* (McCoy), but of different nature (Professor McCoy thinks it possibly ova, but its structure has not yet been made out). These are seen of large size, one being seven inches wide, nine inches long, and one and a half inches thick, but incomplete in length; and a shield-like form, about ten inches long by five inches broad (nearly perfect). Also several conical teeth like those before mentioned, from half an inch to an inch in length, with large plates retaining their bony structure, probably *Cephalaspidan*. Some others resembling, at a cursory glance, oblong shells; and the large scales, probably of *Glyptolepis*, were here obtained; also a portion of fish allied to *Scaphaspis*, and specimens of an Acanthoid fish. Another Acanthoid fish was obtained from here, about ten inches in length in its incomplete state, but it has apparently been about fourteen inches when the whole of the tail was intact. This shows most of the fins, retaining their bony spines *in situ*, and it is considered by Professor McCoy a very interesting specimen. He has in honour of Mr. Langtree, the energetic Secretary for Mines, named it *Chiraiapolus langtreei*. Some large gill-like plates, with radiating fibrous tissue, were

obtained here; also a fragment of jaw, showing internal structure of one large and one small tooth. A specimen, ten inches by six, showing parallel (apparently oblique) lines of very small shagreen-like scales; also many "cylindrical bones, probably of *Colocanth* fish showing canals." It was near this zone that I found a stone, containing casts of "nail-headed neural and hemal spines of *Colocanth* fish," in position, as when attached to the cartilaginous vertebra, which has left no imprint whatever; also a "portion of the trunk of a fish, allied to *Glyptolepis*," showing the large scales in position, and a small fish, "probably the body of a *Cephalaspidan*." These, with many *Gyracanthus*-like spines, and several other fossils, were all obtained from this bed.

T contained in parts numerous plants, which here attain a large size, one specimen left with Professor McCoy, being nine inches across, and one seen as a freestone was over twelve inches across. These specimens are found, in some cases, of considerable length, Professor McCoy having one of about four inches across, and over two feet in length; and longer fractured specimens were left behind.

V.—This bed gave us portions of a jaw, showing the dentition, and several *Gyracanthus* spines, with some undetermined structures; and scales of fish an inch and a quarter in diameter, and teeth. Portions of *Acanthoid* fish were obtained by Mr. Cresswell at this bed, near 10, in which sufficient of the structure can be made out to clearly discern the lateral line of enlarged scales; Professor McCoy has named this *Eupleurosmus cresswelli*. I also found portions of similar remains in this bed near 8. I found here also portions of a fish, having the same character as *Cosmolepides sweeti* (McCoy); a portion of fish allied to *Scaphaspis*, and a stone, eight inches by five inches, with tubercular elevations undetermined.

The W bed is the highest of the series on this side the river, and contains fossils in some respects similar to those described in the bed on which it rests, and apparently differing from it, only in that it seemed to contain less of the remains of the small and fragile fish, and more of the stronger bones, spines, &c., of the larger fish; and these seem to have attained a greater size at the period in which this bed was laid down, than when that below it was deposited. This yielded (at 9) a very large spine, resembling *Gyracanthus obliquus* (McCoy), about nine inches in length, with both the base and point perfect.

I have described the rocks of the one hill to the east of Bridge Creek, but an examination of the strata and fossils of the hill to the West of Bridge Creek shows unmistakably its relation to this one. Certainly, all the beds are not observable, as the river flats (recent) overlap the lower members of the group, but between those that are observable, there is perfect agreement.

It would be highly interesting and important to ascertain if the high hills to the north also contain these same beds, as, if they do, being so much higher than these, they should, on their northern or north-eastern flanks, present even better prospects of great results than did either of the hills which have been here described.

While in the locality, I succeeded in tracing the *Lepidodendra* along the eastern side of the Blue Range Creek to the top of the Hat Hill (over two thousand feet high), and brought back specimens which have been forwarded to Professor McCoy, who has identified some as the *Lepidodendron mansfieldense*. Time forbade me staying longer then, but I hope to be able (should no one more capable undertake the work) at no very distant date to return, and taking up the work where I left off, go on into the country beyond, and ascertain if any interesting geological features still remain to be observed and described, and if so, what.

Although at the risk of appearing egotistical, I think I can best summarise the general results of my work in the words of Professor McCoy, who has provided me with the following, as well as other information, and wishes me to make this use of it:—

“The magnificent collections both of *Lepidodendron* and fish which you have made, and the pains and trouble which you have bestowed on the working out of many of these, and observing and plotting accurately on paper all the fossiliferous strata of the locality, deserve the warmest praise and thanks both from myself and the Department. You have satisfactorily determined the general fact, as I expected, of the superior position of the *Lepidodendra* to the majority of the fish beds; but, further, with a highly intelligent appreciation of the great geological interest of the point, you have proved—what was before uncertain—that they belonged to the same formation, by preserving and bringing down a slab of rock in which the remains of the vegetables and fishes were embedded together. In addition to a large series of all the organic remains found by your predecessors,

you have obtained evidence of several entirely new fishes of great interest, one of the most striking of which I have great pleasure in dedicating to you, as a memorial of your successful labours in clearing up this difficult piece of local geology and palæontology. You have also thrown a flood of light on the other species, by your skilful putting together of the fragments, and showing the relations of many parts by your painstaking clearing of these brittle remains from the hard matrix.

“The whole of these organic remains are now being carefully figured for the next decade of the Palæontology of Victoria, in which further acknowledgment will be made of the value of your friendly help.”

In conclusion, my thanks are due, especially to Professor McCoy, in whose hands the specimens have been placed for description, and to whom I am indebted for the names and descriptions of various forms. To Mr. Murray, for the ready and thorough manner in which he employed his knowledge to assist me in finding the exact locality, &c., whence the first fossils found were obtained. To the Rev. A. W. Cresswell, M.A., for information as to locality and notes of fossils found by him. To Mr. D. Mitchell, for permission to quarry on his estate; and to his managers, Mr. P. F. Nembegin and Mr. Loveband, for their kind assistance. To Mr. P. O'Halloran, for permission to quarry, and assistance. To Mr. McCartney, for permission to camp on the Battery Estate. To Mr. A. H. S. Lucas, M.A., B. Sc., and to Professor Spencer, for encouragement and advice, without whose kindly help, this paper would not, I think, have been presented, they being of opinion that the record of my work would be of interest and value.

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